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As enabling technologies for the in situ exploration of extraterrestrial bodies and for sample return missions continue to emerge, awareness of the need to limit spacecraft-carried biological contamination at the microbial scale is growing, as is the need to prevent contamination of Earth by extraterrestrial solar system material. NASA remains committed to exploring space while avoiding such contamination. To this end, in accordance with NPD 8020.7E, "Biological Contamination Control for Outbound and Inbound Planetary Spacecraft," NASA Policy Guide NPG 8020.12B, "Planetary Protection Provisions for Robotic Extraterrestrial Missions," sets forth requirements applicable to robotic planetary flight programs. These requirements are necessary to enable the Associate Administrator for Space Science to fulfill those responsibilities pertaining to planetary protection. This document is specifically directed to 1) the control of terrestrial microbial contamination associated with robotic space vehicles intended to land, orbit, flyby, or otherwise be in the vicinity of extraterrestrial solar system bodies, and 2) the control of contamination of the Earth and Moon by extraterrestrial solar system material collected and returned by such missions. Implementation of these requirements will ensure that biological safeguards to maintain extraterrestrial bodies as biological preserves for scientific investigations are being followed in NASA's space programs. In particular, NPG 8020.12B is consistent with the biological contamination control objectives of the Committee on Space Research (COSPAR) of the International Council of Scientific Unions and of Article IX of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space (January 27, 1967, TIAS 6347, entered into force October 10, 1967). The above planetary protection requirements apply to all robotic planetary flight activities, with the exception of 1) terrestrial (earth-orbiting) missions, 2) lunar missions, and 3) human missions, except for Shuttle-launched, but otherwise robotic, planetary missions. The planetary flight activities include solar system exploration missions to the major planets as well as missions to planet satellites and to other solar system objects that may be of scientific interest.

This paper will present the planetary protection efforts currently underway at the Jet Propulsion Laboratory (JPL), with a focus on the enabling technologies being developed in support of the Mars Surveyor Program. This planetary protection technologies effort is a multidisciplinary effort that exploits existing JPL and NASA expertise in microbiology, material science, analytical chemistry, precision cleaning, and astrobiology in conjunction with outside, industrial and academic collaborators. The technologies under development include: 1) Cleaning: removing biological contamination (particles, viable/nonviable organisms and residues) from flight hardware surfaces; 2) Sterilization: the elimination of viable organisms on hardware surfaces; 3) Validation: determining the effectiveness of hardware biological decontamination by i) quantifying - measure amount of any remaining contamination; and ii) identifying - characterize nature of any remaining contamination; 4) Archiving: recording the biological history of hardware materials, assembly area, spacecraft, and launch site against future planetary protection and science requirements; 5) Maintenance: includes modeling methods of cross contamination and identifying/minimizing/removing any cross contamination or recontamination during assembly, functional hardware test, transit, rework at remote facilities, any landing, and any Earth return; and 6) Containment: technologies to ensure returned sample integrity.